

EXISTENCE OF POSITIVE MONOTONIC SOLUTIONS OF FUNCTIONAL HYBRID FRACTIONAL INTEGRAL EQUATIONS OF QUADRATIC TYPE

BAPURAO C. DHAGE* AND SOTIRIS K. NTOUYAS**,†

*Kasubai, Gurukul Colony, Ahmedpur-413 515, Dist: Latur, Maharashtra, India
E-mail: bcdhage@gmail.com

**Department of Mathematics, University of Ioannina, 451 10 Ioannina, Greece
E-mail: sntouyas@uoi.gr

Abstract. We present an existence result for positive monotonic solutions for a certain nonlinear functional hybrid integral equation of quadratic type via fixed point theoretic technique of Dhage [10, 11] in Banach algebras. Our result generalizes the existence result proved in Darwish and Ntouyas [7] and thereby several results as special cases with a different method.

Key Words and Phrases: Fractional integral equation, initial value problems, hybrid fixed point theorem, positive solution.

2010 Mathematics Subject Classification: 47H10, 34A12, 34A38.

REFERENCES

- [1] J. Appell, P.P. Zabrejko, *Nonlinear Superposition Operators*, Cambridge Tracts in Mathematics, **95**, Cambridge University Press, 1990.
- [2] I.K. Argyros, *Quadratic equations and applications to Chandrasekhar's and related equations*, Bull. Austral. Math. Soc., **32**(1985), 275-292.
- [3] J. Banaś, M. Lecko, W.G. El-Sayed, *Existence theorems of some quadratic integral equations*, J. Math. Anal. Appl., **222**(1998), 276-285.
- [4] J. Banaś, D. O'Regan, *On existence and local attractivity of solutions of a quadratic integral equation of fractional order*, J. Math. Anal. Appl., **345**(2008), 573-582.
- [5] S. Chandrasekher, *Radiative Transfer*, Dover Publications, New York, 1960.
- [6] M.A. Darwish, *On quadratic integral equation of fractional order*, J. Math. Anal. Appl., **311**(2005), 112-119.
- [7] M.A. Darwish, S.K. Ntouyas, *Monotonic solutions of a perturbed quadratic fractional integral equation*, Nonlinear Anal., **71**(2009), 5513-5521.
- [8] K. Deimling, *Nonlinear Functional Analysis*, Springer-Verlag, Berlin, 1985.
- [9] B.C. Dhage, *On α -condensing mappings in Banach algebras*, The Mathematics Student, **63**(1994), 146-152.
- [10] B.C. Dhage, *A fixed point theorem in Banach algebras with applications to functional integral equations*, Kyungpook Math. J., **44**(2004), 145-155.
- [11] B.C. Dhage, *A nonlinear alternative in Banach algebras with applications to functional differential equations*, Nonlinear Funct. Anal. Appl., **8**(2004), 563-575.

[†]Member of Nonlinear Analysis and Applied Mathematics (NAAM)-Research Group at King Abdulaziz University, Jeddah, Saudi Arabia.

- [12] A. Granas, J. Dugundji, *Fixed Point Theory*, Springer-Verlag, New York, 2003.
- [13] A.A. Kilbas, H.M. Srivastava, J.J. Trujillo, *Theory and Applications of Fractional Differential Equations*, North-Holland Mathematics Studies, 204, Elsevier Science B.V., Amsterdam, 2006.
- [14] K.S. Miller, B. Ross, *An Introduction to the Fractional Calculus and Differential Equations*, John Wiley, New York, 1993.
- [15] I. Podlubny, *Fractional Differential Equations*, Academic Press, San Diego, 1999.

Received: April 8, 2013; Accepted: January 23, 2014.